"2. Whether any, and what steps should be taken for arranging, tabulating, publishing, or otherwise making use of such data.

"3. Whether it is desirable to continue Meteorological Observations at Sea; and if so, to what extent, and in what manner.

"4. Assuming that the system of Weather Telegraphy is to be continued, can the mode of carrying it on and of publishing the results be improved?

"5. What Staff will be necessary for the above purposes?

"I have the honour to be, Sir,
"Your obedient Servant,
"J. Emerson Tennent."

"*The President of the Royal Society.*"

[The President replied to this letter, and forwarded the name of Mr. Francis Galton, F.R.S., selected by the Council to be a Member of the Committee.]

December 7, 1865.

Dr. WILLIAM ALLEN MILLER, Treasurer and Vice-President, in the Chair.

It was announced from the Chair that the President had appointed the following Members of the Council to be Vice-Presidents:—

The Treasurer.
Mr. Gassiot.
Sir Henry Holland.

Mr. Alfred Tennyson, Poet Laureate, and Mr. Robert Grant, were admitted into the Society.

The following communications were read:—

I. "Addition to the Memoir on Tschirnhausen's Transformation." By Arthur Cayley, F.R.S. Received October 24, 1865.

(Abstract.)

In the memoir "On Tschirnhausen's Transformation," Phil. Trans. vol. clii. (1862) pp. 561–568, I considered the case of a quartic equation: viz. it was shown that the equation

$$(a, b, c, d, e \between x, 1)^4=0$$

is, by the substitution

$$y=(ax+b)\mathrm{B}+(ax^2+4bx+3c)\mathrm{C}+(ax^3+4bx^2+6cx+3d)\mathrm{D},$$

transformed into

$$(1, 0, \mathfrak{C}, \mathfrak{D}, \mathfrak{E} \between y, 1)^4=0,$$

where $(\mathfrak{C}, \mathfrak{D}, \mathfrak{E})$ have certain given values. It was further remarked that $(\mathfrak{C}, \mathfrak{D}, \mathfrak{E})$ were expressible in terms of $\mathrm{U}', \mathrm{H}', \Phi'$, invariants of the two forms $(a, b, c, d, e \between \mathrm{X}, \mathrm{Y})^4$, $(\mathrm{B}, \mathrm{C}, \mathrm{D} \between \mathrm{Y}, -\mathrm{X})^2$, of I, J, the inva-

riants of the first, and of Θ', $=BD-C^2$, the invariant of the second of these two forms,—viz. that we have

$$\mathfrak{C}=6H'-2I\Theta',$$
$$\mathfrak{D}=4\Phi',$$
$$\mathfrak{E}=IU'^3-3H'^2+I^2\Theta'^2+12J'\Theta'U'+2I'\Theta'H'.$$

And by means of these I obtained an expression for the quadrinvariant of the form $(1, 0, \mathfrak{C}, \mathfrak{D}, \mathfrak{E}\between y, 1)^4$; viz. this was found to be

$$=IU'^2+\tfrac{4}{3}I^2\Theta'^2+12J\Theta'U'.$$

But I did not obtain an expression for the cubinvariant of the same function: such expression, it was remarked, would contain the square of the invariant Φ'; it was probable that there existed an identical equation, $JU'^3-IU'^2H'+4H'^3+M\Theta'=-\Phi'^2$, which would serve to express Φ'^2 in terms of the other invariant; but, assuming that such an equation existed, the form of the factor M remained to be ascertained; and until this was done, the expression for the cubinvariant could not be obtained in its most simple form. I have recently verified the existence of the identical equation just referred to, and have obtained the expression for the factor M; and with the assistance of this identical equation I have obtained the expression for the cubinvariant of the form $(1, 0, \mathfrak{C}, \mathfrak{D}, \mathfrak{E}\between y, 1)^4$. The expression for the quadrinvariant was, as already mentioned, given in the former memoir: I find that the two invariants are in fact the invariants of a certain linear function of U, H; viz. the linear function is $=U'U+\frac{2}{3}\Theta'H$; so that, denoting by I*, J* the quadrinvariant and the cubinvariant respectively of the form $(1, 0, \mathfrak{C}, \mathfrak{D}, \mathfrak{E}\between y\quad)^4$, we have

$$I^*=\tilde{I}(U'U+4\Theta'H).$$
$$J^*=\tilde{J}(U'U+4\Theta'H),$$

where $\tilde{I}$, $\tilde{J}$ signify the functional operations of forming the two invariants respectively. The function $(1, 0, \mathfrak{C}, \mathfrak{D}, \mathfrak{E}\between y, 1)^4$, obtained by the application of Tschirnhausen's transformation to the equation $(a, b, c, d, e\between x, 1)^4=0$, has thus the *same invariants* with the function

$$U'U+4\Theta'H$$
$$=U'(a, b, c, d, e\between x, 1)^4+4\Theta'(ac-b^2, ad-bc, ae+2bd-3c^2, be-cd, ce-d^2\between x, 1)^4,$$

and it is consequently a linear transformation of the last-mentioned function; so that the application of Tschirnhausen's transformation to the equation $U=0$ gives an equation linearly transformable into, and thus virtually equivalent to, the equation $U'U+4\Theta'H=0$, which is an equation involving the single parameter $\dfrac{4\Theta'}{U'}$: this appears to me a result of considerable interest. It is to be remarked that Tschirnhausen's transformation, wherein y is put equal to a rational and integral function of the order

$n-1$ (if n be the order of the equation in x), is not really more general than the transformation wherein y is put equal to any rational function $\frac{\mathrm{V}}{\mathrm{W}}$ whatever of x; such rational function may, in fact, by means of the given equation in x, be reduced to a rational and integral function of the order $n-1$; hence in the present case, taking V, W to be respectively of the order $n-1$, $=3$, it follows that the equation in y obtained by the elimination of x from the equations

$$\mathrm{V}=(a, b, c, d, e \between x, 1)^4=0,$$
$$y=\frac{(\alpha, \beta, \gamma, \delta \between x, 1)^3}{(\alpha', \beta', \gamma', \delta' \between x, 1)^3}$$

is a mere linear transformation of the equation $\mathrm{AU}+\mathrm{BH}=0$, where A, B are functions (not as yet calculated) of $(a, b, c, d, e, \alpha, \beta, \gamma, \delta, \alpha', \beta', \gamma', \delta')^4$.

II. "A Supplementary Memoir on the Theory of Matrices." By Arthur Cayley, F.R.S. Received October 24, 1865.

(Abstract.)

M. Hermite, in a paper "Sur la théorie de la transformation des fonctions Abéliennes," Comptes Rendus, t. xl. (1855), establishes incidentally the properties of the matrix for the automorphic linear transformation of the bipartite quadric function $xw'+yz'-zy'-wx'$, or transformation of this function into one of the like form, $\mathrm{XW}'+\mathrm{YZ}'-\mathrm{ZY}'-\mathrm{WX}'$. These properties are (as will be shown) deducible from a general formula in my "Memoir on the Automorphic Linear Transformation of a Bipartite Quadric Function," Phil. Trans. t. cxlviii. (1858), pp. 39–46; but the particular case in question is an extremely interesting one, the theory whereof is worthy of an independent investigation. For convenience the number of variables is taken to be *four*; but it will be at once seen that as well the demonstrations as the results are in fact applicable to any *even* number whatever of variables.

III. "On the Existence of Glycogen in the Tissues of certain Entozoa." By Michael Foster, M.B. Communicated by Professor Huxley. Received November 4, 1865.

Although glycogen has been found by various observers in the tissues of many of the Invertebrata, no one, as far as I know, has noticed the very remarkable amount which may be obtained from some of the Entozoa. I first came across this fact while working upon a tape-worm; unfortunately I neglected to determine the quantity of glycogen I obtained, and have not since had an opportunity of repeating the observation. The following remarks apply only to the round worm (*Ascaris lumbricoides?*) which dwells in the intestines of the common pig.